CLAIMS

What is claimed is:

1. (Original) A method for controlling a photoresist layer above a substrate comprising:

forming, exposing, and developing the photoresist layer, forming at least one opening having a first dimension;

exposing the photoresist layer with the at least one opening to modify the photoresist layer characteristics after developing the photoresist layer; and

heating the photoresist layer with the at least one opening, after exposure, to achieve a thermal reflow of the photoresist layer with the at least one opening to modify the dimension of the at least one opening in the photoresist layer.

2. (Original) The method of claim 1 wherein exposing the photoresist layer with the at least one opening causes a mitigation of bulk expansion of the photoresist layer during reflow.

3. (Original) The method of claim 1 wherein exposing the photoresist layer with the at least one opening is from the group consisting of exposing to photons, exposing to electrons, or exposing to ions.

4. (Original) The method of claim 1 wherein heating the photoresist layer with the at least one opening to achieve a thermal reflow controls the formation of a critical dimension that is less then the resolution of a lithographic tool set.

5. (Original) The method of claim 1 wherein heating the photoresist layer with the at least one opening to achieve a thermal reflow controls the formation of a critical dimension that is less then the fundamental resolution of the photoresist layer.

6. (Original) The method of claim 1 wherein controlling the heating of the photoresist layer to modify the dimension of the at least one opening in the photoresist layer decreases the dimension of the opening in the photoresist layer.

7. (Original) A method for controlling a photoresist layer above a substrate comprising:

forming, exposing, and developing the photoresist layer forming at least one opening having a first dimension;

exposing the photoresist layer with the at least one opening to an electron beam causing a mitigation of bulk expansion of the photoresist layer during a subsequent reflow; and

heating the photoresist layer with the at least one opening, after exposure, to achieve a thermal reflow of the photoresist layer to decrease the dimension of the at least one opening in the photoresist layer.

8. (Original) The method of claim 7 wherein the electron beam is generated using an ElectronVision ECA3C.

9. (Original) The method of claim 7 wherein the photoresist layer with the at least one opening is exposed to the electron beam at 1.5K to 2.5K electron volts, with a density of 2,000 micro-Coulombs per square centimeter, for between 20 to 40 seconds

10. (Original) The method of claim 7 wherein exposing the photoresist layer with the at least one opening to the electron beam modifies at least one of the photoresist layer characteristics from the group consisting of the cross linking characteristic, the glass transition temperature, the decomposition temperature, the molecular weight.

11. (Original) The process of claim 7 wherein controlling the heating controls the formation of a photoresist layer critical dimension.

12. (Original) The process of claim 7 wherein controlling the heating is performed at 125 to 180 degrees Centigrade for 60 to 90 seconds.

13. (Original) A method for controlling a photoresist layer above a substrate comprising:

forming, exposing, and developing the photoresist layer forming at least one opening having a first dimension;

exposing the photoresist layer with the at least one opening to a light source causing a mitigation of bulk expansion of the photoresist layer during a subsequent reflow; and

heating the photoresist layer with the at least one opening, after exposure, to achieve a thermal reflow of the photoresist layer to decrease the dimension of the at least one opening in the photoresist layer.

14. (Original) The method of claim 13 wherein the photoresist layer formed on the underlying substrate is 193nm in thickness.

15. (Original) The method of claim 13 wherein the photoresist layer formed on the underlying substrate is 248nm in thickness.

16. (Original) The method of claim 13 wherein the light source is a flash-lamp.

17. (Original) The method of claim 16 wherein the light source is generated using [manufacturer/product name of machine(s)].

18. (Original) The method of claim 16 wherein the light source has a wavelength of 193nm.

19. (Original) The method of claim 18 wherein the light source subjects the photoresist layer with the at least one opening to approximately 4 to 6 mJoules per square centimeter for approximately 30 seconds.

20. (Original) The method of claim 16 wherein the light source has a wavelength of 248nm.

21. (Original) The method of claim 20 wherein the light source subjects the photoresist layer with the at least one opening to approximately 10mJoules per square centimeter for approximately 30 seconds.

22. (Original) The method of claim 13 wherein exposing the photoresist layer with the at least one opening to a light source modifies at least one of the photoresist layer characteristics from the group consisting of the cross linking characteristic, the glass transition temperature, the decomposition temperature, the molecular weight.

23. (Original) The process of claim 13 wherein controlling the heating controls the formation of a photoresist layer critical dimension.

24. (Original) The process of claim 13 wherein controlling the heating is performed at performed at 125 to 180 degrees Centigrade for 60 to 90 seconds.

25. (Original) A substrate having an etched feature having been formed by a process comprising:

forming, exposing, and developing a photoresist layer above a substrate forming at least one opening having a first dimension;

exposing the photoresist layer with the at least one opening to modify the photoresist layer characteristics after developing the photoresist layer;

heating the photoresist layer with the at least one opening, after exposure, to achieve a thermal reflow of the photoresist layer to decrease the dimension of the at least one opening in the photoresist layer; and

etching the photoresist layer with the at least one opening to develop an integrated circuit feature.

26. (Original) The method of claim 25 wherein the process further comprises etching the photoresist layer with the at least one opening after controlling the heating to modify the dimension of the at least one opening in the photoresist layer

27. (Original) The method of claim 25 wherein exposing the photoresist layer with the at least one opening is from the group consisting of exposing to photons, exposing to electrons, or exposing to ions.

28. (Original) The method of claim 27 wherein the exposing to photons is a light source having a wavelength of 193nm.

29. (Original) The method of claim 27 wherein the exposing to photons is a light source having a wavelength of 248nm.

30. (Original) The method of claim 25 wherein heating the photoresist layer with the at least one opening to achieve a thermal reflow controls the formation of a critical dimension that is less then the resolution of a lithographic tool set.

31. (Original) The method of claim 25 wherein heating the photoresist layer with the at least one opening to achieve a thermal reflow controls the formation of a critical dimension that is less then the fundamental resolution of the photoresist layer.